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Evaluation of extra early lentil varieties in rice-fallow areas of West Bengal

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Abstract

A field experiment was conducted to assess seven lentil varieties in terms of phenology, yield attributing characters and yield in randomized block design at district seed farm, AB block, BCKV, West Bengal, during *rabi* seasons of 2014-15 and 2015-16. Result revealed that among the seven varieties evaluated, L4710 was the earliest maturing one, whereas, PL406 was late maturing type and took 110 days. Regarding the yield attributing characters, the no. of primary branches per plant was highest in both KLS 218(2.85) and IPL 534(2.85). Lack of similarity among lentil varieties was noticed based on seed index also. RKL-604-01 is bold seeded type (3.15g), followed by IPL 534 (2.85g). IPL 534 produced highest yield (1559 kg ha⁻¹) with an advantage of 9.40% to 51.25% over other varieties. In terms of pooled data of two years, L4710 was also recorded a good yield (1425kg ha⁻¹) with maximum number of pods per plant (80.9). With the changing climate scenario, variety L4710 and IPL 534 were found to be promising in terms of phenology, yield attributing character, and yield after long duration rice.

Keywords: Lentil, genotype, phenology, yield, rice-fallow

Introduction

After the harvest of *kharif* rice in India more than 11 m ha lands remain fallow (Subbarao *et al.*, 2001) ^[1] because of biotic, abiotic, bio-physical and socio-economic constraints like moisture stress during planting and crop growth, unavailability of appropriate varieties of winter crop etc. (Ali and Kumar, 2009) ^[2]. On the other hand, India has achieved self-sufficiency in food grain production but not in pulses and oilseeds. This *rabi* rice fallow areas are appeared as huge potential niche for pulse production as well as crop intensification since it requires very less inputs, restore soil fertility and the residual soil moisture is enough to grow a pulse crop (Ali, 2014) ^[3]. Lentil is one of the most important pulse crops containing 351 kcal energy, 24.6g protein, 6.51 mg Fe, 3.3 mg Zn and 479 mg folate in 100 g seed. But growing of long duration rice varieties in most part of West Bengal create problem in sowing of existing lentil varieties. As a consequence, during the later growth stages, lentil faces heat stresses which contributed to low productivity. Besides, short winter duration, rainfall variability followed by low residual soil moisture and fast water table decline in *rabi* season leads to terminal heat stress, early, mid and terminal drought specially during flowering and pod filling stages of traditional lentil varieties results flower drop, poor pod formation and considerable yield loss. In this backdrop, for the improvement of farming resilience high yielding short duration varieties should be promoted.

Materials and Methods

The experiment was conducted during *rabi* season of two consecutive years 2014-15 and 2015-16 at the District Seed Farm, AB block, Kalyani, Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal, India. The experimental field is a medium land with well-drained Gangetic alluvial soil (order: Inceptisol), which belonged to the class of sandy loam with medium fertility, almost neutral in reaction, organic carbon 0.49%, available nitrogen 225.25 kg ha⁻¹, phosphorus 25.81 kg ha⁻¹ and potassium 187.55 kg ha⁻¹. The experiment was laid out in randomized block design involving seven lentil varieties (KLS 218, RKL-604-01, L 4710, RKL-607-01, PL 406, L 4711 and IPL 534) which were replicated thrice. The seeds were sown on plot of 4 m × 3 m area in line. Lentil genotypes were sown in rows 25 cm apart after harvesting of *aman* rice. Fertilizer was applied at the time of land preparation @ 20:40:40 kg ha⁻¹ N: P₂O₅:K₂O. The data on phenology and yield attributes were recorded from 5 plants, selected randomly from each plot at harvest of crop.

Result

A clear difference was noticed among the lentil varieties in terms of days to flower initiation, 50% flowering, 100% flowering and days to maturity. Initiation of flower took 40 to 44.3 days after sowing in 2014-15 and 2015-16 respectively (Table 1). Pooled data revealed that the variety L4710 took minimum days (42.15) to initiate flower. Days to 50% flowering (47.3) and days to 100% flowering (50.7) were also fastest in variety L4710 followed by L4711 and RKL-604-01 (Table 1). Among the seven lentil varieties characterized phenologically, PL 406 took maximum days to initiate flower, 50% flowering and 100% flowering. Dixit *et al.* (2011) [4] evaluated twenty nine lentil varieties as early, medium and late flowering category, among which PL406 categorized as medium flowering type. The varieties took about 75 to 112 days and 86 to 106 days to mature during both the year of experiment with very early (75 days) in L4710 during 2014-15 and almost 86 days during 2015-16. Whereas the pooled data over two growing seasons revealed that PL 406 was the last one to mature among the varieties which required little more days i.e. almost 110. Reja *et al.* (2017) [5] also reported that PL406 took 68 days to initiate flower, 77 days for 50% flowering and 112 days to mature.

The varieties differed significantly in respect to yield and yield variants during both the year of experiment (Table 2). Number of primary branches per plant varied by 2.3 to 3.0 during 2014-15 and 2.5 to 3.2 in 2015-16 with maximum in variety RKL-607-01 (3.0) during first year and with PL406 (3.2) in second year. But the pooled data exhibited maximum number of primary branches per plant with the varieties KLS

218(2.85) and IPL 534(2.85) (Table 2). In the year 2014-15, highest number of pods per plant was recorded with variety L4710 (87.0) followed by IPL534 (75.6), pooled analysis also reported the same trend, whereas during the second year IPL 534 yielded maximum pods per plant (76.3) followed by L4710 (74.8) and RKL-607-01 (68.5). From pooled data, lowest no of pod per plant was observed with variety PL 406 (47.9). Seed size or weight revealed the seed boldness whether it is macrosperma or microsperma type. 100 seed weight was varied significantly from 1.6 g to 3.0 g and 1.5g to 3.3g during 2014-15 and 2015-16 respectively. Pooled data revealed that RKL-604-01 (3.15g) and IPL 534 (2.85g) were macrosperma type whereas PL 406 (1.55 g), KLS 218 (1.7g) and L4711 (1.7g) were categorized as microsperma type. Dixit *et al.* (2009) [6] and Reja *et al.* (2017) [5] also characterized lentil genotypes and noted seed index of KLS 218 as 1.8g and 1.79g respectively. Yield potentiality of these varieties varied significantly to the tune of 1094 to 1655 kg ha⁻¹ and 1060 to 1462 kg ha⁻¹ respectively during 2014-15 and 2015-16. Based on yield potentiality, IPL 534 ranked first (1559 kg ha⁻¹) followed by L4710 (1425 kg ha⁻¹) and PL 406 was the lowest yielder (1077 kg ha⁻¹) according to pooled value among the seven varieties. IPL 534, L4710, L4711 and RKL-607-01 had 51.25%, 41.51%, 19.03% and 11.98% yield advantage over PL 406 respectively. Higher number of primary branches per plant, pod per plant and 100 seed weight resulted yield advantage in those lentil varieties.

Based on maturity and yield level, the lentil varieties L 4710 and IPL 534 were found to be promising and can be promoted for cultivation in *rabi* rice-fallow areas of West Bengal.

Table 1: Phenology of extra early lentil varieties

Variety	Days to flower initiation			Days to 50% flowering			Days to 100% flowering			Days to maturity		
	2014-15	2015-16	Pooled	2014-15	2015-16	Pooled	2014-15	2015-16	Pooled	2014-15	2015-16	Pooled
KLS 218	61.5	65.3	63.4	73	72.3	72.65	81	83.3	82.15	110.5	104.3	107.4
RKL-604-01	48	49	48.5	60	58.3	59.15	65	65	65	100	89.7	94.85
L 4710	40	44.3	42.15	43.5	51	47.25	46	55.3	50.65	75	85.7	80.35
RKL-607-01	49	53.7	51.35	64	60.7	62.35	67	69.7	68.35	98	95.7	96.85
PL 406	66	72.7	69.35	75	81.3	78.15	83.5	87	85.25	112.5	105.7	109.1
L 4711	45.5	55	50.25	52.5	59.3	55.9	60.5	65	62.75	97	88.7	92.85
IPL 534	62	56.7	59.35	67	64	65.5	73	74	73.5	98.5	102.7	100.6
S.Em (±)	0.70	0.77	2.35	0.71	0.64	2.46	0.75	0.78	1.51	0.67	0.50	3.79
CD(p=0.05)	1.42	1.68	8.27	1.54	1.39	8.68	1.62	1.71	5.34	1.44	1.10	13.39

Table 2: Yield attributes and yields of extra early lentil varieties

Variety	Primary branches per plant			No. of pods per plant			100 seed weight (g)			Yield (kg ha ⁻¹)		
	2014-15	2015-16	Pooled	2014-15	2015-16	Pooled	2014-15	2015-16	Pooled	2014-15	2015-16	Pooled
KLS 218	2.9	2.8	2.85	68.8	47.8	58.3	1.8	1.6	1.7	1284	1107	1196
RKL-604-01	2.3	2.7	2.5	53.7	64	58.9	3.0	3.3	3.15	1163	1182	1173
L 4710	2.4	2.5	2.45	87.0	74.8	80.9	2.3	1.8	2.05	1471	1378	1425
RKL-607-01	3.0	2.5	2.75	61.7	68.5	65.1	2.6	2.8	2.7	1168	1244	1206
PL 406	2.3	3.2	2.75	43.0	52.7	47.9	1.6	1.5	1.55	1094	1060	1077
L 4711	2.3	2.6	2.45	72.7	62.6	67.7	1.7	1.7	1.7	1341	1222	1282
IPL 534	2.6	3.1	2.85	75.6	76.3	75.9	2.9	2.8	2.85	1655	1462	1559
S.Em (±)	0.22	0.27	0.23	3.44	3.86	6.13	0.06	0.04	0.13	54.10	38.09	49.96
CD(p=0.05)	0.48	0.60	NS	10.60	8.40	NS	0.14	0.09	0.47	117.88	117.40	176.25

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